

JAN 29 2009

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

Amendments To The Claims

The listing of claims presented below will replace all prior versions, and listings, of claims in the application.

Listing of claims:

1. **(currently amended)** An RF front-end transceiver comprising:

a frequency synthesizer or a base band processor providing a digital frequency control voltage (VDT) signal and an analog frequency control voltage (VAT) signal; ~~an oscillator wherein the frequency synthesizer or a base band processor comprises:~~

a phase frequency detector (PFD) receiving a reference frequency (f_{REF}) signal and an N-divider frequency (f_{DIV}) signal;

a current pump (CP) operatively coupled to the PFD;

a low pass filter (LPF) operatively coupled to the CP wherein the LPF provides the VAT signal;

a digital tuner (DT) operatively coupled to the CP and to the LPF such that the DT and LPF are parallel to each other wherein the DT provides the VDT signal;

a digital analog tuning voltage controlled oscillator (DAT-VCO) operatively coupled to the LPF and to the DT wherein the DAT-VCO providing a resonant frequency (f_{LO}) signal, a f_{VCO} signal and the f_{DIV} signal in response to the VAT and VDT signals, the DAT-VCO outputting the the f_{LO} such that a frequency of the f_{LO} is controlled by the VAT and VDT signals; and

an N divider receiving the f_{VCO} signal from the DAT-VCO and transmitting the f_{REF} to the PFD for outputting a resonant frequency signal such that a frequency of the resonant frequency signal from the oscillator is controlled by the frequency control signal;

a receive amplifier for amplifying and outputting a receive RF signal such that a frequency of the receive RF signal from the receive amplifier is controlled by the frequency control signal VAT and VDT signals;

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

a receive mixer for mixing the receive RF signal amplified and the **resonant frequency f_{LO}** signal to convert the receive RF signal into a receive base band signal such that a frequency of the receive base band signal from the receive mixer is controlled by the **frequency-control-signal VAT and VDT signals;**

a transmit mixer for mixing a transmit base band signal and the **resonant frequency f_{LO}** signal to convert the transmit base band signal into a transmit RF signal such that a frequency of the transmit RF signal from the transmit mixer is controlled by the **frequency-control-signal VAT and VDT signals;** and

a transmit amplifier for amplifying and outputting the transmit RF signal such that a frequency of the transmit RF signal from the transmit amplifier is controlled by the **frequency-control-signal VAT and VDT signals**, wherein **[[a]] resonant frequency of at least one of frequencies of the DAT-VCO, the receive amplifier, the receive mixer, the transmit mixer and the transmit amplifier are all [[is]] controlled by the frequency-control-signal VAT and VDT signals so that a maximum power can be transmitted even when a band of the f_{REF} signal is changed.**

2. (currently amended) The RF front-end transceiver according to claim 1, wherein the **frequency-control-signal is VAT and VDT signals are** provided from the base band processor.

3. (currently amended) An RF front-end receiver comprising:

a frequency synthesizer or a base band processor providing a **digital frequency control voltage (VDT) signal and an analog frequency control voltage (VAT) signal ; an oscillator wherein the frequency synthesizer or a base band processor comprises:**

a phase frequency detector (PFD) receiving a reference frequency (f_{REF}) signal and an N-divider frequency (f_{DIV}) signal;

a current pump (CP) operatively coupled to the PFD;

a low pass filter (LPF) operatively coupled to the CP wherein the LPF provides the VAT signal;

a digital tuner (DT) operatively coupled to the CP and to the LPF

JAN 29 2009

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

such that the DT and LPF are parallel to each other wherein the DT provides the VDT signal;

a digital analog tuning voltage controlled oscillator (DAT-VCO) operatively coupled to the LPF and to the DT wherein the DAT-VCO providing a resonant frequency (f_{LO}) signal, a f_{VCO} signal and the f_{DIV} signal in response to the VAT and VDT signals, the DAT-VCO outputting the f_{LO} such that a frequency of the f_{LO} is controlled by the VAT and VDT signals; and

an N divider receiving the f_{VCO} signal from the DAT-VCO and transmitting the f_{REF} to the PFD for outputting a resonant frequency signal such that a frequency of the resonant frequency signal from the oscillator is controlled by the frequency control signal;

a receive amplifier for amplifying and outputting a receive RF signal such that a frequency of the receive RF signal from the receive amplifier is controlled by the frequency control signal VAT and VDT signals; and

a receive mixer for mixing the receive RF signal amplified and the resonant frequency f_{LO} signal to convert the receive RF signal into a receive base band signal such that a frequency of the receive base band signal from the receive mixer is controlled by the frequency control signal VAT and VDT signals, wherein [[a]] resonant frequency of at least one of frequencies of the DAT-VCO, the receive amplifier and the receive mixer [[is]] are all controlled by the frequency control signal VAT and VDT signals so that a maximum power can be transmitted even when a band of the f_{REF} signal is changed.

4. (currently amended) The RF front-end receiver according to claim 3, wherein the frequency control signal VAT and VDT signals is provided from the base band processor.

5. (currently amended) The RF front-end receiver according to claim 3, wherein the frequency control signal includes an analog frequency control signal and a digital frequency control signal receive amplifier has either a common gate amplifier

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

configuration or a cascode amplifier configuration.

6. **(currently amended)** The RF front-end receiver according to claim 3, wherein the frequency of the ~~resonant frequency~~ f_{LO} signal is controlled by ~~an analog frequency control signal and a digital frequency control signal~~ VAT and VDT signals, and wherein, a resonant frequency of the receive amplifier and the receive mixer is controlled by the ~~frequency control signal or only the digital frequency control signal~~ VAT and VDT signals.

7. **(currently amended)** The RF front-end receiver according to claim 6, wherein the receive amplifier has a net input resistance controlled by the ~~digital frequency control~~ VDT signal.

8. **(currently amended)** An RF front-end transmitter comprising:
a frequency synthesizer or a base band processor providing a frequency control (FC) signal; an oscillator wherein the frequency synthesizer or a base band processor comprises:

a phase frequency detector (PFD) receiving a reference frequency (f_{REF}) signal and an N-divider frequency (f_{DIV}) signal;

a current pump (CP) operatively coupled to the PFD;

a low pass filter (LPF) operatively coupled to the CP wherein the LPF provides the VAT signal;

a digital tuner (DT) operatively coupled to the CP and to the LPF such that the DT and LPF are parallel to each other wherein the DT provides the VDT signal;

a digital analog tuning voltage controlled oscillator (DAT-VCO) operatively coupled to the LPF and to the DT wherein the DAT-VCO providing a resonant frequency (f_{LO}) signal, a f_{VCO} signal and the f_{DIV} signal in response to the VAT and VDT signals, the DAT-VCO outputting the f_{LO} such that a frequency of the f_{LO} is controlled by the VAT and VDT signals; and

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

an N divider receiving the f_{VCO} signal from the DAT-VCO and transmitting the f_{REF} to the PFD for outputting a resonant frequency signal such that a frequency of the resonant frequency signal from the oscillator is controlled by the frequency control signal;

a transmit mixer for mixing a transmit base band signal and the ~~resonant frequency f_{LO}~~ signal to convert the transmit base band signal into a transmit RF signal such that a frequency of the transmit RF signal from the transmit mixer is controlled by the frequency control signal VAT and VDT signals; and

a transmit amplifier for amplifying and outputting the transmit RF signal such that a frequency of the transmit RF signal from the transmit amplifier is controlled by the frequency control signal VAT and VDT signals, wherein ~~[[a]] resonant frequency of at least one of frequencies of the DAT-VCO,~~ the transmit mixer and the transmit amplifier ~~[[is]] are all~~ controlled by the frequency control signal VAT and VDT signals so that a maximum power can be transmitted even when a band of the f_{REF} signal is changed.

9. (currently amended) The RF front-end transmitter according to claim 8, wherein the frequency control signal VAT and VDT signals is provided from the base band processor.

10. (currently amended) The RF front-end transmitter according to claim 8, wherein the frequency control signal includes an analog frequency control signal and a digital frequency control signal receive amplifier has either a common gate amplifier configuration or a cascode amplifier configuration.

11. (currently amended) The RF front-end transmitter according to claim 8, wherein the frequency of the ~~resonant frequency f_{LO}~~ signal is controlled by an analog frequency control signal and a digital frequency control signal the VAT and VDT signals, and wherein, a resonant frequency of the transmit amplifier and the transmit mixer is controlled by the frequency control signal or only the digital frequency control signal VAT and VDT signals.

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

12. (currently amended) The RF front-end transmitter according to claim 11, wherein the transmit amplifier has a net input resistance controlled by the ~~digital frequency control~~ VDT signal.

13. (currently amended) An amplifier comprising:

a frequency synthesizer or a base band processor providing a frequency control (FC) signal ~~[[;]]~~ wherein the frequency synthesizer or a base band processor comprises:

a phase frequency detector (PFD) receiving a reference frequency (f_{REF}) signal and an N-divider frequency (f_{DIV}) signal;

a current pump (CP) operatively coupled to the PFD;

a low pass filter (LPF) operatively coupled to the CP wherein the LPF provides the VAT signal;

a digital tuner (DT) operatively coupled to the CP and to the LPF such that the DT and LPF are parallel to each other wherein the DT provides the VDT signal;

a digital analog tuning voltage controlled oscillator (DAT-VCO) operatively coupled to the LPF and to the DT wherein the DAT-VCO providing a resonant frequency (f_{LO}) signal, a f_{VCO} signal and the f_{DIV} signal in response to the VAT and VDT signals, the DAT-VCO outputting the f_{LO} such that a frequency of the f_{LO} is controlled by the VAT and VDT signals; and

an N divider receiving the f_{VCO} signal from the DAT-VCO and transmitting the f_{REF} to the PFD;

an amplification unit for amplifying a signal inputted to an input unit and outputting the amplified signal such that a frequency of the amplified signal from the amplification unit is controlled by the ~~frequency control signal~~ VAT and VDT signals to an output unit; ~~an oscillator for outputting a resonant frequency signal such that a frequency of the resonant frequency signal from the oscillator is controlled by the frequency control signal;~~ and

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

an input resonant unit connected to the input unit, and for changing a frequency of the ~~resonant frequency~~ f_{LO} from the ~~oscillator~~ DAT-VCO in accordance ~~[[with]]~~ to the frequency of the ~~frequency control signal~~ VAT and VDT signals, wherein the ~~frequency control signal is used to control the frequency of the resonant frequency signal outputted from the oscillator~~ resonant frequencies of the amplification unit, the DAT-VCO, and the input resonant unit are all controlled by VAT and VDT signals so that a maximum power can be transmitted even when a band of the f_{REF} signal is changed.

14. (currently amended) The amplifier according to claim 13, further comprising:

an output resonant unit connected to the output unit, and for changing the frequency of the ~~resonant frequency~~ f_{LO} signal in accordance ~~[[with]]~~ to the ~~frequency control signal~~ VAT and VDT signals.

15. (currently amended) The amplifier according to claim 13, wherein the ~~frequency control signal includes an analog frequency control signal and a digital frequency control signal~~ amplification unit has a common gate amplifier configuration.

16. (currently amended) The amplifier according to claim 13, wherein the resonant unit is any one of a first LC tank including a inductor controlled by the ~~digital frequency control~~ VDT signal and a capacitor controlled by the ~~analog frequency control~~ VAT signal;

a second LC tank including a capacitor controlled by the ~~digital frequency control~~ VDT signal, a capacitor controlled by the ~~analog frequency control~~ VAT signal and a fixed capacitor;

a third LC tank including an inductor and a capacitor controlled by the ~~digital frequency control~~ VDT signal, and a capacitor controlled by the ~~analog frequency control~~ VAT signal and a fixed inductor; and

a fourth LC tank including an inductor controlled by the ~~digital frequency control~~ VDT signal, an inductor controlled by the ~~analog frequency control~~ VAT signal and a fixed capacitor.

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

17. (currently amended) The amplifier according to claim 13, wherein the ~~frequency control signal includes a digital frequency control signal~~ amplification unit has a cascode amplifier configuration.

18. (currently amended) The amplifier according to claim 13, further comprising:
a net resistance control unit connected to the input unit, and for changing the net input resistance in accordance ~~[[with]]~~ to the frequency of the ~~frequency control signal~~ VAT and VDT signals.

19. (currently amended) The RF front-end transceiver according to claim 1 wherein
the base band processor for inputting the receive base band signal and for outputting the transmit base band signal;
the ~~oscillator~~ DAT-VCO, the receive amplifier and the receive mixer comprising an RF front-end receiver exhibiting an input impedance;
the transmit mixer and the transmit amplifier comprising an RF front-end transmitter exhibiting an having an output impedance; and
the ~~oscillator~~ DAT-VCO, the receive amplifier, the receive mixer, the transmit mixer and the transmit amplifier are controlled by the ~~frequency control signal~~ VAT and VDT signals to substantially match the input impedance with the output impedance of the transceiver such that the transceiver transmits substantially a maximum power over a specific frequency band.

20. (currently amended) The RF front-end transceiver according to claim 1, wherein the ~~frequency synthesizer comprises: a phase frequency detector (PFD) for receiving a reference frequency, f_{REF} ; a current pump operatively coupled to the phase frequency detector; a low pass filter (LPF) operatively coupled to the current pump; a digital tuner (DT) in parallel to the low pass filter and operatively coupled to the current pump; the oscillator operatively coupled to the LPF and to the DT, wherein the oscillator is a digital analog tuning voltage controlled oscillator (DAT-VCO) for providing the output resonant frequency, f_{LO} ; an N~~

Application Serial No. 10/572,725
Reply to office action of November 25, 2008

PATENT
Docket: CU-4700

~~divider operatively coupled to the DAT VCO and to the PFD, wherein a digital control voltage (VDT) signal output is located between the DT and the DAT VCO, and an analog control voltage (VAT) signal output is located between the LPF and the DAT VCO~~ receive amplifier has either a common gate amplifier configuration or a cascode amplifier configuration.